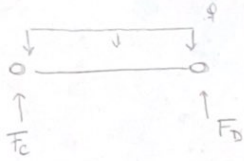
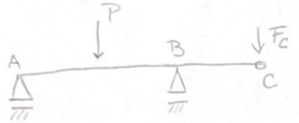


# Ejercicio 1

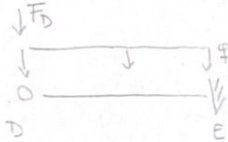
a)



$$\begin{aligned} \sum F_v = 0 &\Rightarrow F_c + F_d = qL \\ \sum M_c = 0 &\Rightarrow F_d \cdot L = q \frac{L^2}{2} \end{aligned} \quad \left. \vphantom{\begin{aligned} \sum F_v = 0 \\ \sum M_c = 0 \end{aligned}} \right\} F_c = F_d = qL/2$$



$$\begin{aligned} \sum F_v = 0 : V_a + V_b &= P + qL/2 \\ \sum M_A = 0 : V_b \cdot L &= \frac{PL}{2} + \frac{3qL^2}{4} \end{aligned} \quad \left. \vphantom{\begin{aligned} \sum F_v = 0 \\ \sum M_A = 0 \end{aligned}} \right\} \begin{aligned} V_b &= \frac{P}{2} + \frac{3qL}{4} \\ V_a &= \frac{P}{2} - \frac{qL}{4} \end{aligned}$$



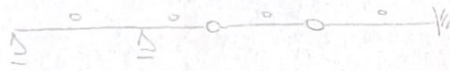
$$\begin{aligned} \sum F_H = 0 : H_E &= 0 \\ \sum F_v = 0 : V_E &= qL + \frac{qL}{2} = \frac{3qL}{2} \\ \sum M_E = 0 : M_E &= -qL^2/2 - qL^2/2 = -qL^2 \\ \Rightarrow M_E &= -qL^2 \end{aligned}$$

b)  $V_b = 2V_a \Rightarrow \frac{P}{2} + \frac{3qL}{4} = P - \frac{qL}{2} \Rightarrow \frac{5qL}{4} = \frac{P}{2} \Rightarrow \frac{P}{q} = \frac{5L}{2}$

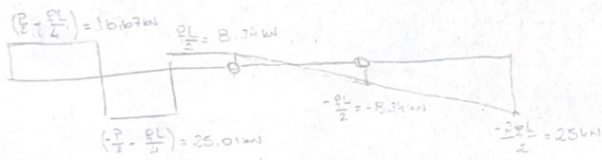
c)  $M_E = -50 \text{ kNm} = -q(3\text{m})^2 \Rightarrow q = 5,56 \text{ kN/m}$

d) N

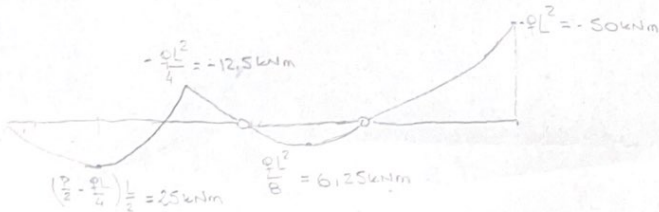
$q = 5,56 \text{ kN/m}, P = 41,67 \text{ kN}$



V



M



e) Altura del baricentro.

$$j_0 = \frac{20 \cdot 5 \cdot 17,5 + 15 \cdot 5 \cdot 7,5}{20 \cdot 5 + 15 \cdot 5} = 13,2 \text{ cm}$$

Inercia de la sección

$$I = \frac{20 \cdot 5^3}{12} + 20 \cdot 5 (17,5 - 13,2)^2 + \frac{15 \cdot 5^3}{12} + 15 \cdot 5 (7,5 - 13,2)^2 = 5900 \text{ cm}^4$$

$$M_{\max}^- = 50 \text{ kNm}$$

$$\rightarrow \sigma_{tr} = \frac{50 \text{ kNm} \cdot 6,8 \text{ cm}}{I} \quad \sigma_{\text{comp}} = \frac{50 \text{ kNm} \cdot 13,2 \text{ cm}}{I}$$

$$M_{\max}^+ = 25 \text{ kNm}$$

$$\rightarrow \sigma_{tr} = \frac{25 \text{ kNm} \cdot 13,2 \text{ cm}}{I} \quad \sigma_{\text{comp}} = \frac{25 \text{ kNm} \cdot 6,8 \text{ cm}}{I}$$

La tensión máxima es de compresión con  $M_{\max}^-$ . Como  $\sigma_{\text{adm, comp}} < \sigma_{\text{adm, tr}}$  solo tengo que verificar esa.

$$\sigma_{\text{max}} = \frac{50 \text{ kNm} \cdot 13,2 \text{ cm}}{5900 \text{ cm}^4} = 1,12 \text{ MPa} < 120 \text{ MPa} = \sigma_{\text{adm}}$$